ABSTRACT

IMAGE PROCESSING APPARATUS

An image processing apparatus is operable to embed data into an image. The apparatus comprises a combining processor operable to introduce the data into a transform domain representation providing a plurality of sub-bands divided by spatial frequency components, and, in combination with a transform processor, to combine the data with the image in one of a transform domain form, the transform processor generating a transform domain form of the image, the data being combined with the image by the combining processor in the transform domain, and the transform processor generating a spatial domain representation of the combined image and data, or a spatial domain form of the image, the transform processor generating a spatial domain representation of the transform domain data, the data being combined with the image by the combining processor in the spatial domain. The data is introduce into at least one of the sub-bands in a scan direction, the sub-band representing in the transform domain low spatial frequencies of the image in one direction and high spatial frequencies of the image in another direction, the scan direction being in the same direction in the sub-band as the direction of the low spatial frequencies of the image. Since the low spatial frequencies of the image correspond to the lower energy transform domain components of the image, embedding the data in the same direction as the lower spatial frequencies provides an improved likelihood of correctly detecting the embedded data and correspondingly as a result of the improved detection likelihood, the energy of the embedded data signal can be reduced, thereby reducing any possible visual impairments to the image in the spatial domain.

[Fig 6]